Name of Applicant: James W. Gallagher

Rank: Associate Professor

Proposal Submission Date: 1/15/20

Expertise: Cell Biology

Prior Faculty Development Grant Outcomes:

My previous Faculty development grant for the Summer of 202 was successful. The purpose of that proposal was to integrate Labster Simulation Laboratories into the Cell Biology 207 course. Due to the pandemic, this proposal was very timely, as we were forced to hold all laboratories virtually for the length of the semester. The Faculty Development funds were critical in permitting implementation of the project and getting the laboratories running in a timely manner and ready for the new semester. There needed to be a change to the protocol as proposed however, since no traditional hands-on laboratories could be done as a reference for evaluating the effectiveness of the labster laboratories. To address this, the learning data collected for students from the Fall of 2020 were compared to the learning of the students from the Spring of 2020 and Fall of 2019, which were done in the traditional method. Over the semester, students in the F2020 cohort (with labster) had a 82% grade average in laboratory and a 78% overall grade average (N of 22). This is compared to 84% for laboratory and a 76% in class average (N=49) for the other 2 cohorts without labster. This indicates that for the class overall scores, students were not negatively impacted in regards to knowledge of the content in comparing the cohorts and non cohort sections. However, it should be noted that students in evaluations stated they did not gain what they regarded as the necessary skills to actually perform the experiments that were done in simulations. This issue should be addressed in the upcoming terms, as remote learning is becoming more and more common as technology ability continues. The success of this project should also be highlighted as Labster was simultaneously implemented in both other Introductory Biology classes and will be used in Physics and Chemistry classes in the Spring of 2021.

Proposal Submission Term: Summer 2021

Turning Cell Biology into a complete Online Class

James Gallagher, Ph.D.
Associate Professor
Biology Department-Cell Biology

Spring 2021

Background

Modern instructional methods have been shifting from traditional classroom based instructional method to digital and remote delivery methods. My previous Faculty Development proposal illustrated that moving to a remote digital model has the potential to be successful for online education. However it was noted that students felt unprepared to complete the experiments as if they were done in a face to face setting. This disparity indicates that while the material and knowledge delivered in a laboratory setting are sufficient utilizing simulation laboratories, the students themselves recognized that they lacked the skills to complete the tasks themselves. The Covid-19 pandemic is still ongoing, and students are likely going to be online for classes for the foreseeable future. Therefore, it is prudent to try to give students the best experience possible, which includes hands on experience for laboratories. If we do not go this route, it is possible that students might be able to graduate from College without participating in a hands on laboratory for 2 years or more. Thus, more needs to be done to ensure a proper education and to give students the skill set they need to succeed in internships and research.

Approach

For this Faculty development proposal, I intend to utilize a pre-assembled kit from Carolina Biological which will give students the ability to get hands on experimentation done remotely. At home experimentation requires supplies to be provided to students directly, which then during the laboratory period, a demonstration can be completed live with the students following along from their own home laboratories.

To truly understand cell biology, it is important to visualize live cells firsthand. This prospect is daunting and typically problematic since cells require microscopes for visualization, equipment which is typically not readily available at home. This is why Carolina Biological was chosen for this project. Carolina offers a Mini-Duo Microscope which is a scaled down version of the microscopes we use in laboratory. With these microscopes, students will be able to do remotely what would normally be done only in face-to-face laboratory. Therefore, it makes sense to purchase the kits through Carolina to get access to this resource. Alongside the microscopes, the purchased skits will include other activities typically used in Bio207 classroom, such as enzyme catalysis and DNA extraction. These activities are staples to the Cell Biology class but were not able to be offered this past fall of 2020 in any hands-on fashion.

To ensure that all students will be compliant, supplies will be purchased through a combination of funds from this grant, as well as access to normal departmental funds. With both of these sources of revenue, kits of up to $200 will be provided to all students taking Bio207, which currently has an enrollment of 24. In the future, if these kits are deemed worthwhile, the cost will be expected to be covered by the students taking the course as a required additional purchase. After the simulations are completed and the Fall 2020 semester is finished, students will be assessed on the gains in knowledge on the relevant material by the same criteria and methods that were developed over the summer and will be compared to the Spring of 2020 class results.

It is anticipated that these hands-on laboratory exercises, along with the previous simulations will be able to give students the same educational experience as if they were in the classroom. To assess this, students will be assessed on learning from the modules using pre- and post-questions as well with a self-reported survey on the effectiveness of each module. The results from these studies will be shared within the Biology department at our August department meeting will be given and if proven to be effective, a recommendation to submit this a full online Bio207 to the Distance Learning Committee for inclusion as an online course would be brought to the department. I am hopeful that a positive outcome of this project will result in the ability to truly offer Cell Biology in an online format, one of, if not the

absolute first in the Biology Department. Summary salary is requested for this project since all of the analysis of the results will be done during the summer.

Sample Carolina Cell Biology Kit-$191.50

Biology Starter Set (Required) $40.50

Distance Learning Microscope (Required because of one or more of your choices) $27.00

Introduction to Microscopy $32.00

Enzyme Catalysis $10.75

Biological Macromolecules and Enzymes $27.75

Cellular Respiration in Germinating Peas $16.00

Mitosis and Meiosis: Chromosome Simulation $16.00

DNA Extraction $13.50

Blood Typing with Eldon Cards $8.00

Fundamentals of Microscopy $0.00

Objectives (with anticipated completion times)

1. Contract with Carolina for the purchase and trial of all experimentation(January 2021)

2. Purchase and Integrate the hands on laboratories within the Cell Biology course alongside the already acquired course software. 24 students(1 class section, 2 laboratory sections), (March-May 2021)

3. Survey students and Assess remote Laboratory modules effectiveness on material retention, engagement, enjoyment and cognitive ability. Acquire feedback about the m(June/July 2021)

4. Share with Biology Department Faculty as a presentation at our August Department meeting

Budget

1. Budgetary allowance for Kit purchase	=	$2000
2. Summer Salary- 2 months @2750/month	=	$5500
Total	=	$7500